

1.030.521



# PATENT SPECIFICATION

DRAWINGS ATTACHED

1.030.521

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*Index at acceptance:*—B7 G (49B4, 49B5, 49C, 49E1) ; F1 G15; F1 J2A1A

*Int. Cl.:*—B 64 d // F 02 c, k

## COMPLETE SPECIFICATION

### Mounting Arrangement for Gas Turbine Engines in Aircraft

We, ROLLS-ROYCE LIMITED, a British company of Nightingale Road, Derby, Derbyshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to aircraft having jet propulsion gas turbine engines, of the by-pass type which are supported on beams projecting from and carried by the aircraft structure.

In the past, the beam has taken a solid rectangular form adapted so as to extend at least partly around the outer casing of the engine and thus is additive to the frontal area of the engine or engines, producing an increase in drag on the aircraft during flight.

According to the present invention, there is provided an assembly comprising a beam adapted to be secured to an aircraft and supporting at least one engine of the by-pass type in which at least part of the beam is disposed within the by-pass duct of the engine.

Preferably the beam is adapted so as not to form any substantial blockage in the by-pass duct.

The beam may comprise a plurality of interconnected strut-like members which may be of aerofoil shape or alternatively the said part of the beam may be formed from two spaced unitary structures, one of which is mounted downstream of the other in the by-pass duct, the structures both being secured to a common metal sheet extending therebetween. In such alternative, each of said unitary structures may be provided with apertures for the passage of by-pass air therethrough.

Preferably the beam is adapted to extend around part of the circumference of the engine.

The invention also includes an aircraft comprising an assembly as described above.

Embodiments of the invention will now be particularly described, by way of example

only, with reference to the accompanying drawings, in which:—

Figure 1 is a plan view of the tail end of an aircraft and four forward propulsion engines mounted on the aircraft by means of an assembly in accordance with the invention,

Figure 2 is a view on line 2—2 in Figure 1, and

Figure 3 is a sectional view on line 3—3 in Figure 1.

Referring to the drawings, 10 indicates an aircraft fuselage, 12 the tail fin and 14 the tail plane.

Four jet propulsion gas turbine engines 16 are mounted on the fuselage 10 forward of the tail plane 14, the engines being arranged in pairs on opposite sides of the fuselage 10. Each pair of engines is carried on a beam 18 projecting from the fuselage 10.

As can be seen from Figure 3 of the drawings, each engine 16 comprises a low pressure compressor 20 and a high pressure compressor 22 in flow series, driven respectively by low pressure and high pressure turbines 24 and 26 via shafts 28 and 30.

Combustion equipment 32 is interposed between the high pressure compressor 22 and the high pressure turbine 26 into which air compressed by the compressors is delivered wherein fuel is mixed and the fuel air mixture is then burnt.

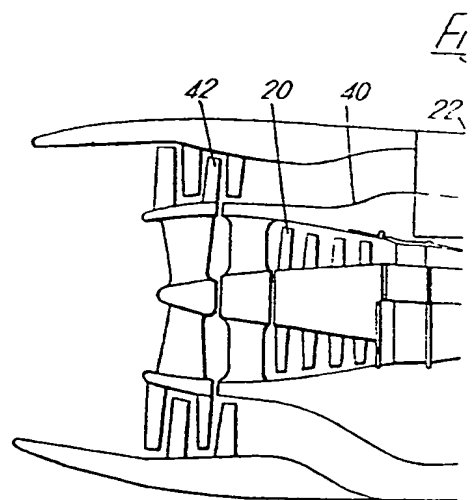
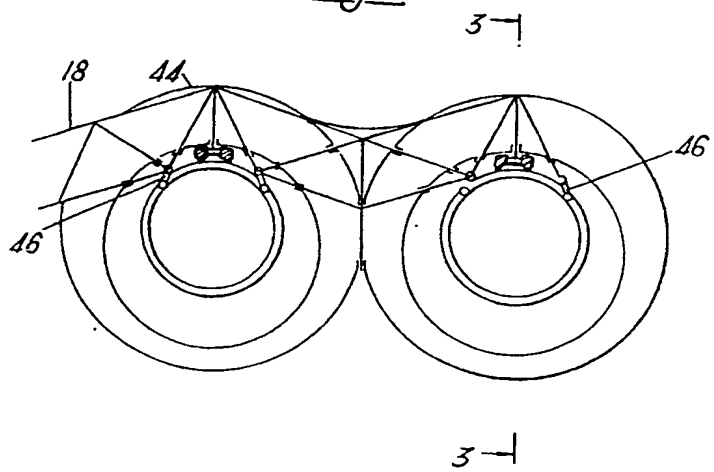
The products of the combustion of the fuel and air mixture pass through the high and low pressure turbines thus rotating the turbines and effecting rotation of the compressors. After passing through the turbines the combustion products enter the engine jet pipe 34 and then pass to atmosphere through a propulsion nozzle 36.

The low pressure compressor, high pressure compressor, combustion equipment and high pressure and low pressure turbines are all enclosed within a common, axially extending casing 38.

- An annular member 40 surrounds the casing 38 to provide a further duct through which air can flow, and rotatable within the duct are a plurality of blades 42 which form extensions of the rotor blades of the low pressure compressor. Thus air issuing from the downstream end of the duct will augment the thrust produced by the products of combustion issuing from the casing 38.
- The above described engine is enclosed within a pod or nacelle which is indicated at 44.
- As stated previously the engines are supported on the aircraft by means of a beam 18. The beam 18 is constructed from a plurality of struts 45 connected together to form a member which in cross-section is rectangular. One end of the beam 18 is connected to the fuselage, in any convenient manner, and as can be seen from Figure 2 of the drawings it extends through the wall of the pod or nacelle 44 through the by-pass passage or duct, across the slight gap between the two engines and into the by-pass passage of the second engine.
- Each engine is connected to the beam 18 by links or other suitable connections 46 disposed two on the front face of the beam and one on the rear of the beam which engage the outer surface of casing 38.
- In an alternative embodiment (not shown), the beam may be formed from two unitary structures one of which is arranged upstream of the other in the by-pass duct. Each unitary structure is in the form of an I-section which extends across the by-pass duct, and is apertured to enable by-pass air to pass there-through. The unitary structures are both secured to a common metal sheet extending therebetween so that loads parallel to the engine axis can be communicated between the structures.
- It has previously been proposed to support engines from the fuselage of an aircraft, by means of a beam, but the beam has been arranged to extend around the outer casing of the engine or engines.
- It will be appreciated that in the case where the beam extends around the outer casing of the engine the frontal area of the engine will be increased, since the pod or nacelle must also enclose the beam, with a resultant increase in drag on the aircraft.
- The disadvantage is overcome in the above described arrangement since the beam extends through the duct or by-pass passage whereby no increase in the frontal area of the engine occurs.
- Throughout the specification the term by-pass engine is to be understood as meaning an engine in which part of the air compressed by the engine compressor means does not pass through the combustion equipment or turbine and also includes engines having a duct surrounding the engine in which further compressor means are rotatable.
- WHAT WE CLAIM IS:—
1. An assembly comprising a beam adapted to be secured to an aircraft and supporting at least one gas turbine jet propulsion engine of the by-pass type in which at least part of the beam is disposed within the by-pass duct of the engine.
  2. An assembly according to claim 1 in which said part of the beam is adapted so as not to form any substantial blockage in the by-pass duct.
  3. An assembly according to claim 1 or claim 2 in which the beam comprises a plurality of interconnected strut-like members.
  4. An assembly according to claim 3 in which the strut-like members are of aerofoil shape.
  5. An assembly according to claim 1 or claim 2 in which said part of the beam is formed from two spaced unitary structures, one of which is mounted upstream of the other in the by-pass duct, the structures both being secured to a common metal sheet extending therebetween.
  6. An assembly according to claim 5 in which each of said unitary structures is provided with apertures for the passage of by-pass air therethrough.
  7. An assembly according to any preceding claim in which the beam is adapted to extend around part of the circumference of the engine.
  8. An assembly substantially as described herein with reference to the accompanying drawings.
  9. An aircraft comprising an assembly in accordance with any preceding claim.

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Fig. 2.

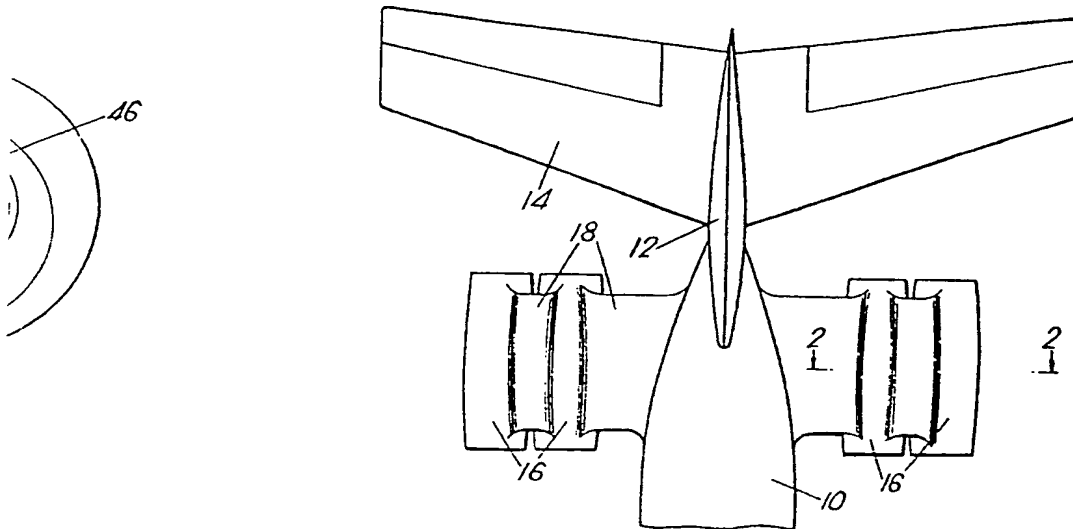


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1 SHEET

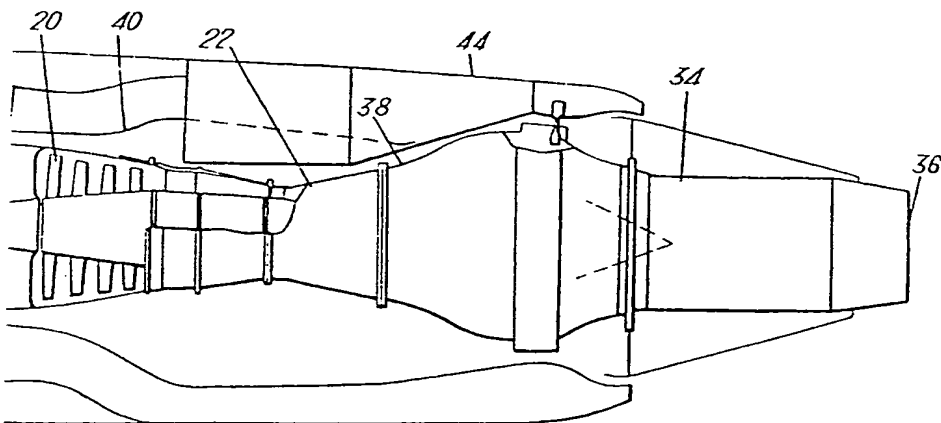
COMPLETE SPECIFICATION

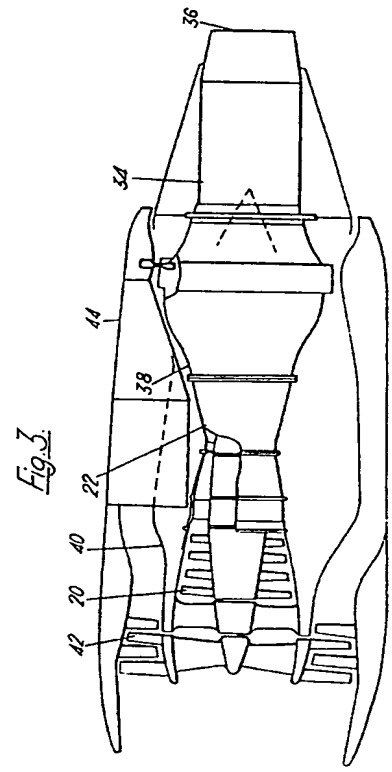
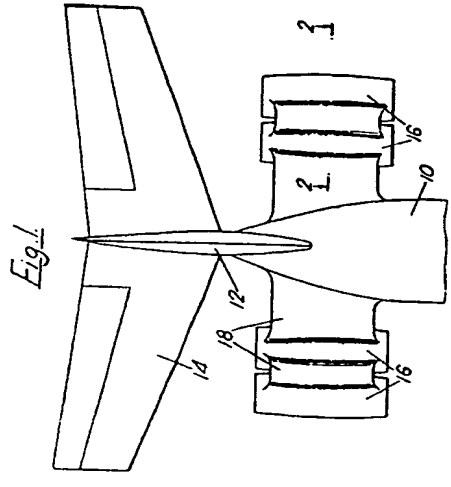
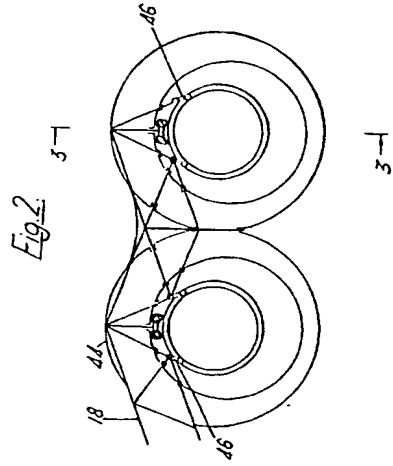
This drawing is a reproduction of  
the Original on a reduced scale.

*Fig. 1.*



*Fig. 3.*







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Application No: GB 0225932.3  
Claims searched: 1-22

Examiner: Robert Lynch  
Date of search: 8 April 2003

## Patents Act 1977 : Search Report under Section 17

### Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance	
X	1, 2	GB 1030521	(Rolls Royce) See figures 1 - 3, lines 18 - 23 of page 1, and lines 18 - 29 of page 2. Document discloses engine mounting with connecting means 18 attached to core 38, and passing through outer housing 44.
X	1	GB 2375513	(Rolls Royce) See whole document, in particular figures 1 and 2. Document discloses gas turbine with core 24 and outer housing or nacelle 42, with connecting means 44 attached to the core and passing through the housing.
X	1	GB 2360749	(Rolls Royce) See figure 1 and line 26 of page 4 to line 10 of page 5. Document discloses a gas turbine with a core 36 and outer housing 28, and has a connecting pylon 40 connected to the core, and passing through the housing.
A	-	US 5088279	(General Electric) See figure 4. Document discloses a gas turbine engine with members 78 passing through the outer casing.
A	-	US 5277382	(General Electric) Document discloses an engine mount.

### Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

### Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC<sup>N</sup>:

FIG, B7G

Worldwide search of patent documents classified in the following areas of the IPC<sup>7</sup>:



INVESTOR IN PEOPLE

**Application No:** GB 0225932.3  
**Claims searched:** 1-22

**Examiner:** Robert Lynch  
**Date of search:** 8 April 2003

F02C, B64C, B64D

The following online and other databases have been used in the preparation of this search report:

Online: EPODOC, WPI, PAJ, OPTICS, TXTUS0, TXTUS1, TXTUS2, TXTUS3, TXTEP1, TXTGB1, TXTWO1